

REMARKS/ARGUMENTS

Applicant thanks the Examiner for the Office Action dated March 21, 2007. In response to the issues raised, we offer the following submissions and amendments.

Amendments

Independent claims 1, 19 and 37 have been amended to highlight the features distinguishing the present invention from the cited art. In particular, the amendments further define the heater elements in the ink chambers to be suspended at different levels in the ink chambers. This is clearly described and illustrated in the embodiment shown in Figures 51 and 53.

Accordingly, the amendments do not add any new matter.

Specification

At Page 1, (just above "Field of the Invention"), the Applicant inserted a new paragraph entitled "Cross-Reference to Related Applications", as required. The Applicant submits that this amendment introduces no new matter.

Claims – 35USC§102

Claims 1-3, 5-7, 10, 19-21, 23-25, 28, 37-39, 40-44 and 47 stand rejected for lack of novelty in light of US 4,965,594 to Komuro.

Independent claims 1, 19 and 37 have been amended to incorporate the specific features of claims 8, 26 and 45 to highlight that the heater elements are *within* the ink chamber. This is a significant distinction from printheads of the type disclosed in Komuro where the heater is embedded in the substrate adjacent the ink chamber. The suspension of heater elements through the interior of an ink chamber substantially reduces the dissipation of heat into the substrate and increases the printhead efficiency. The multiple suspended heater design provided by the present invention offers the ability to vary drop volumes while remaining 'self cooling'. The energy input to the heater elements to raise the temperature of the drop from ambient to boiling point can be less than the thermal capacity of the ejected drop. In other words, the heat from the heater elements is removed from the printhead by the ejected ink.

In Komuro, the heater elements 11A, 21A and 31A are layers in a laminate structure beneath the ink orifice 2. The orifice 2, or at least the ink flow path to the orifice 2, is the nearest corresponding feature to the ink chamber of the present invention. It is clear that the heater elements of Komuro are not suspended in the chamber and not within the chamber at all. They are embedded in the underlying substrate.

In light of this, Komuro fails to anticipate independent claims 1, 19 or 37. It follows that dependent claims 2, 3, 5-7, 10, 20, 21, 23-25, 28, 38, 39, 40-44 and 47 are also novel.

Claims – 35USC§103

Claims 4, 9, 13-15, 22, 27, 31-33, 46 and 50-52 are rejected as obvious in light of Komuro, in view of US 6,019,457 to Silverbrook.

As discussed above, Komuro does not teach a printhead with heater elements suspended at different levels *within* the ink chamber as defined in amended claims 1, 19 or 37. Silverbrook is similarly silent as to any printheads with heater elements suspended within the ink chamber.

Accordingly, the citations do not support a §103 rejection of these claims.

Claims 8, 12, 18, 26, 30, 36, 45, 49 and 55 are rejected as obvious in light of Komuro, in view of US 5,706,041 to Kubby et al.

Combining the suspended heater of Kubby with Komuro is not obvious as Kubby ejects ink from the side of the substrate, or in other words, parallel to the plane of deposition. Fabricating a so called ‘roof shooter’ printhead, (i.e. ejects normal to the plane of deposition) is a fundamentally different design. Suspending the heater in a roof shooter requires the heater to be temporarily supported on a scaffold structure while the rest of the nozzle is deposited. The scaffold must then be removed along with the chamber roof scaffold without damage to the heater. These are not trivial issues and there is no teaching as to how they may be addressed in either of the citations.

Accordingly, there is not motivation for the skilled worker to combine Kubby and Komuro to yield the present invention.

Accordingly, the citations do not support a §103 rejection of these claims.

Claims 11, 29 and 48 are rejected as obvious in light of Komuro, in view of US 6,543,879 to Feinn et al.

Feinn also fails to teach a printhead with heater elements suspended at different levels *within* the ink chamber.

Accordingly, the citations do not support a §103 rejection of these claims.

Claims 16, 34 and 53 are rejected as obvious in light of Komuro, in view of The Fabrication and Reliability Testing of Ti/TiN Heaters (DeMoor).

The DeMoor paper does not describe a printhead with heater elements suspended at different levels *within* the ink chamber.

Accordingly, the citations do not support a §103 rejection of these claims.

Claims 17, 35 and 54 are rejected as obvious in light of Komuro, in view of US 5,969,005 to Yamashita et al.

Komuro does not teach suspended heater elements positioned inside the ink chamber. Yamashita is also silent as to this feature. As claims 17, 35 and 54 are each appended to amended claims 1, 19 and 37 respectively, the cited documents fail to teach all the elements of the invention.

Accordingly, the citations do not support a §103 rejection of these claims.

It is respectfully submitted that the Examiner's rejections have been successfully traversed and the application is now in condition for allowance. Accordingly, favorable reconsideration is courteously solicited.

Very respectfully,

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